

(12) UK Patent Application (19) GB (11) 2 144 696 'A

(43) Application published 13 Mar 1985

(21) Application No 8404267

(22) Date of filing 17 Feb 1984

(30) Priority data

(31) 3366

(32) 14 Mar 1983

(33) IT

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(51) INT CL⁴

B65G 47/30 29/02

(52) Domestic classification

B8A 802 829 840 8G

U1S 1114 B8A

(56) Documents cited

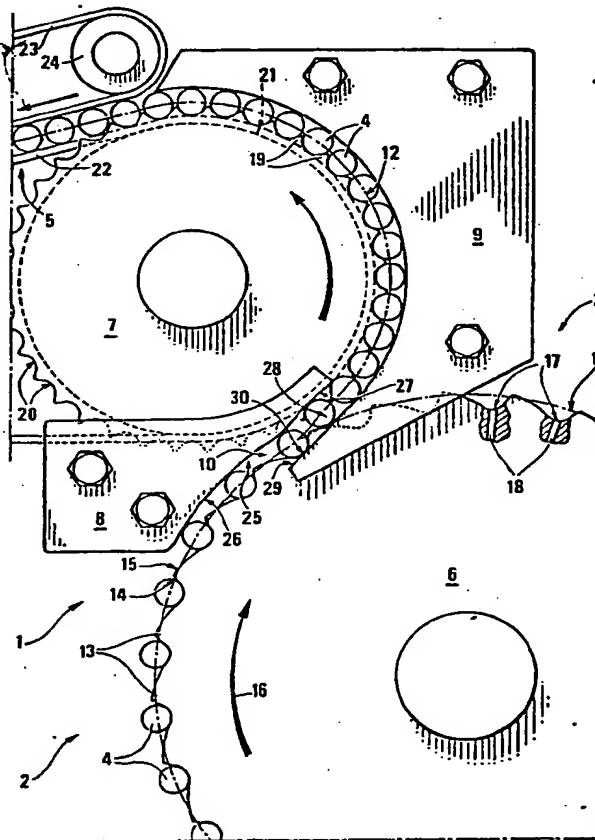
None

(58) Field of search

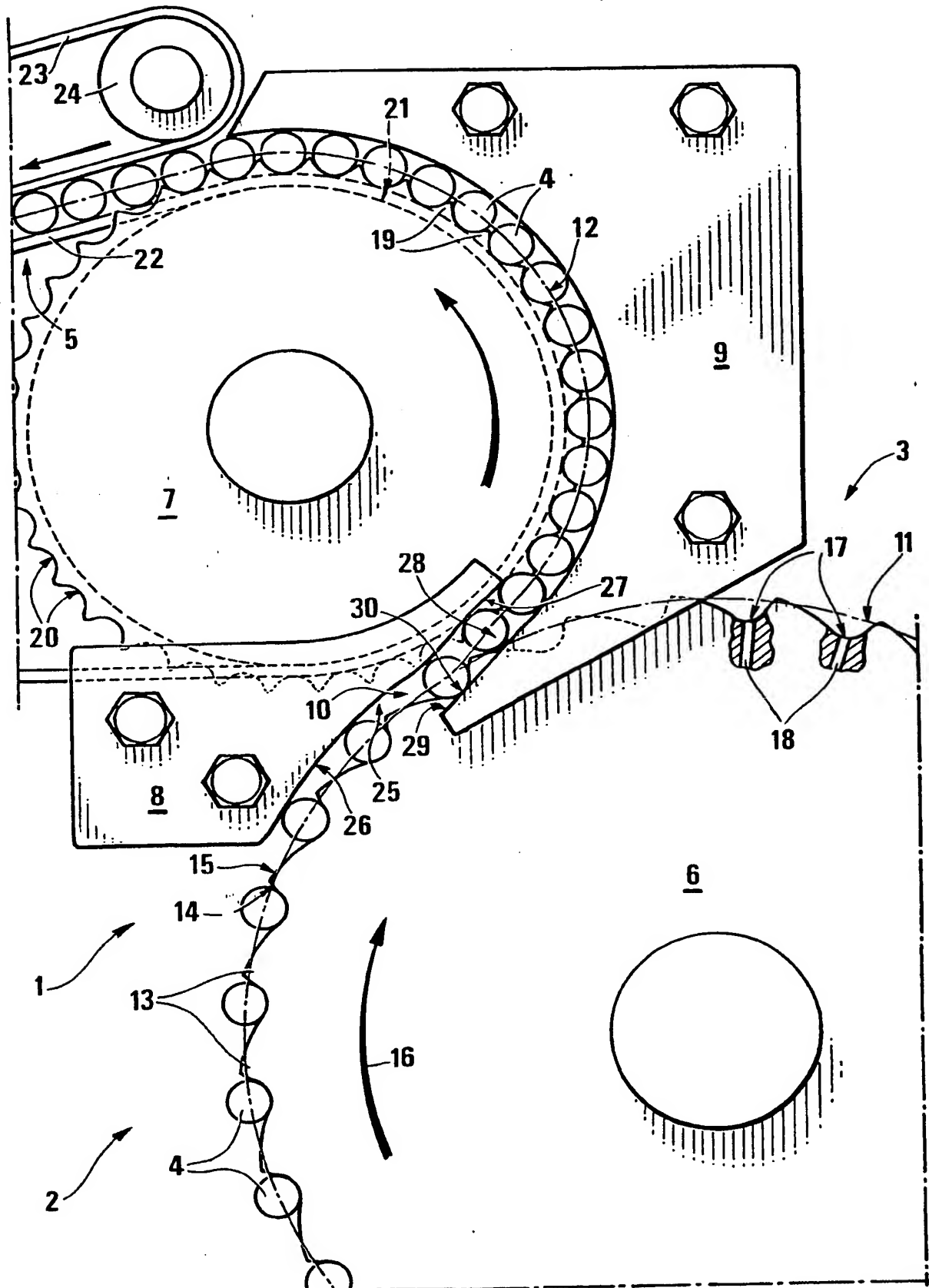
B8A

(54) Transferring articles between
rotary conveyers having pockets at
different pitches

(57) Small rod-shaped items (4) are
conveyed along a conveyor channel
(10) extending between a first roller (6)
with recesses (17) and a second roller 7
with recesses which have closer
itches. The larger-pitch recesses (17)
are defined by teeth (13) designed, in
use, to move along the said channel
(10) and intersect with one of their
edges (15) a contour (28) on the said
channel so as to define temporary
moving recesses (30) for feeding the
said items (4) along the said channel
(10).



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SPECIFICATION

Pitch regulating device for small rod-shaped items

5 The present invention relates to a pitch regulating device for small rod-shaped items, particularly suitable for use on a filter assembling machine for presetting the pitch between two successive cigarettes carried crosswise in relation to their axes on a conveyor at the output of the said filter assembling machine.

10 Though the device according to the present invention is designed to regulate the pitch of all types of small rod-shaped items fed in succession with a preset pitch, the following description will refer solely, though by way of a non-limiting example, to the aforementioned application of regulating the pitch between cigarettes coming off a filter assembling machine.

15 On the said filter assembling machines, cigarettes and filters are usually fed along preset routes by rollers with constant-pitch radial recesses, each designed to accommodate one cigarette. Obviously, the speeds at which the said rollers turn round their axes are proportional with the rate at which the cigarettes are fed into the filter assembling machine by one or more manufacturing machines arranged upstream from it.

20 As, in recent times, the output of manufacturing machines has been practically doubled by the introduction of machines capable of manufacturing two cigarette rods at the same time, the surface speed the said rollers would have to run at to cater with such an increase in output would easily result in the cigarettes being thrown out of their relative recesses.

25 Wherever possible, an appropriate way of overcoming this drawback is to reduce the pitch between successive cigarettes so as to reduce the surface speed of the said rollers or, rather, to maintain the surface speed of the feed rollers alongside an increase in the rate at which the cigarettes are fed into the filter assembling machine. A known device for regulating the pitch between successive cigarettes on a filter assembling machine is described and claimed in British Patent No. 1.479.341 whereby the cigarettes coming off the filter assembling machine are sucked off a first and transferred over to a second roller arranged tangent to each other.

30 To be more precise, the said first roller is provided with a number of evenly-spaced peripheral recesses each having a preset width considerably greater than the diameter of the cigarette, whereas the said second roller is provided with a number of peripheral recesses essentially equal in diameter to that of the cigarettes.

35 The ratio between the surface speeds at which the two rollers are made to turn round their respective axes is the same as that between the widths of the said respective recesses, each cigarette being transferred from one recess on the first roller to another on the second at the point of tangency of the two rollers.

40 To be more precise, before being transferred, each cigarette is held in place by suction means at the

downstream end of the recess on the said first roller and is transferred into a recess on the second roller when the said recess is set perfectly in relation to the cigarette at the said point of tangency. At this point, the suction exerted through the recess on the first roller is cut off and the cigarette is held by suction inside the recess on the second roller. As the surface speed of the latter is lower than that of the first roller, it causes the cigarette being transferred to slide along its recess on the first roller and, at the same time, to move away from the edge of the first roller.

45 In this way, the cigarette being transferred is allowed enough time to detach itself sufficiently from the edge of the first roller to avoid being cut by the upstream end of its recess on the first roller.

50 On the above device, each cigarette, when transferred from the first to the second roller, is slowed down sharply, the extent of deceleration being equal to the difference in the surface speeds of the first and second rollers. As this deceleration is practically instantaneous, it leads to negative acceleration and, consequently, forces of inertia sufficient, at times, to damage the cigarettes being transferred.

55 The aim of the present invention is to provide a perfected pitch regulating device which provides for regulating the pitch the cigarettes are being fed at, when they are transferred between two conveyor rollers, by regulating speed gradually or, rather, without creating excessive acceleration.

60 With this aim in view, the present invention relates to a pitch regulating device for small rod-shaped items, the said device comprising a first and second counter-rotating roller and a device, arranged between the said rollers, for conveying the said items; the said rollers having first and second peripheral teeth respectively, each adjacent pair of the said first teeth and each adjacent pair of the said second teeth defining a first and second recess respectively for the said items; the said first and second recesses being evenly spaced round the first and second roller respectively with a first pitch and second pitch respectively, the latter being smaller than the said first pitch; the said rollers being arranged side by side and designed to turn round their respective axes in opposite directions and at speeds the ratio of the absolute values of which is equal to the ratio between the said respective pitches; characterised by the fact that the said conveying device comprises a channel, for guiding the said items, located between the said two rollers and extending between a point of intersection with a pitch surface on the said first roller and a point of essential tangency with a pitch surface on the said second roller; part of the said first teeth extending inside the said channel and engaging, on one edge, with a side contour of the channel itself, so that each defines a temporary recess for one of the said items arranged along the said channel; each of the said temporary recesses coinciding with one of the said first recesses at one point along the said channel; the said edge of each of the said first teeth being designed to move the relative temporary recess along the said channel at a speed that can be regulated continuously between a maximum, equal to the surface speed of the said first recesses, and a minimum essentially equal to the

surface speed of the said second recesses.

Further characteristics and advantages of the present invention will now be described with reference to the attached drawing showing a side view of a non-limiting arrangement.

The attached drawing shows the output (1) of a filter assembling machine indicated as a whole by number 2. Output 1 comprises a conveying device or pitch regulator, indicated as a whole by number 3, designed to receive finished cigarettes (4) and transfer them, with a different pitch, on to an output conveyor (5).

Device 3 comprises a first (6) and a second (7) toothed roller, arranged side by side and essentially tangent to each other, and a first (8) and second (9) fixed guide cam defining a route or channel (10) for linking the contours of rollers 6 and 7 and extending essentially from a point of intersection with pitch surface 11 on roller 6 and a point of essential tangency with a pitch surface (12) on roller 7.

The contour of roller 6 is provided with a number of essentially serrated, evenly-spaced teeth (13) each having two curved edges (14, 15), the first upstream in relation to the second, in the direction of rotation of roller 6 shown by arrow 16, and having the concave side facing outwards, whereas the second has the convex side facing outwards.

At the blend point, edges 14 and 15 on each of teeth 13 are essentially perpendicular to each other, edge 14 extending in an essentially radial direction and edge 15 bending backwards in a direction almost tangent with pitch surface 11.

The end of each curved edge (14) blended with edge 15 on the tooth (13) upstream defines a peripheral recess (17) into which comes out a suction duct (18) for retaining a cigarette (4) the radius of which is essentially the same as that of recess 17.

Each edge 15 defines a cam designed to guide cigarette 4 as it comes out and as described in more detail later on. The contour of roller 7 is provided with a number of teeth (19) defining recesses (20) similar to 17 and each designed to accommodate a cigarette (4) which is held inside recess 20 by suction means comprising ducts not shown in the drawing and similar to ducts 18.

Roller 7 has a cylindrical surface (21), smaller in diameter than pitch surface 12, round which is wound a belt (22) stretched between roller 7 and a transmission pulley not shown in the drawing. A top branch of belt 22 is arranged facing and parallel to a bottom branch of belt 23 which is looped round two rollers (24) only one of which is shown in the drawing.

Together, belts 22 and 23 define conveyor 5 which is arranged at a tangent in relation to roller 7 and designed to lift cigarettes 4 out of recesses 20 and feed them, held tight between belts 22 and 23, to a machine not shown in the drawing.

Guide cam 8 has an active profile (25) comprising a first and second curved section numbered 26 and 27 respectively. Section 26 extends outside a contour section of roller 6 and just far enough away from it to avoid sliding contact with cigarettes 4 inside recesses 17. Section 27, on the other hand,

comprises a portion concentric with roller 7 and slightly smaller than it in diameter at the bottom of recesses 20 and a portion blending the said concentric portion and section 26. Guide cam 9 has an active side contour (28) essentially identical to section 27 so as to make the width of channel 10 essentially constant and barely sufficient to allow cigarettes 4 through. Contour 28 has an input section (29) arranged at an essentially constant distance from the said portion blending section 27 and section 26 and tangent to the bottom of any of recesses 17 when the latter is turned by roller 6 to correspond with the tip of the blend portion on contour 25. Operation of the device is as follows.

Owing to the arrangement of contour 28 in relation to edges 15 of teeth 13 at the start of channel 10, each cigarette (4), once it moves into contact with the start of section 27 on contour 25, is lifted from recess 17 by section 29 on contour 28. After the cigarette has been lifted, edge 15 upstream from the said recess (17) moves along channel 10 so as to intersect contour 28 and define, for the said cigarette (4), a temporary recess (30) moving along contour 28.

Owing to the convex shape of the said edge (15) and the fact that its slope in relation to the radius of roller 6 is the opposite of that on contour 28 and, generally speaking, that of channel 10 when the latter is engaged by tooth 13, the intersection of each edge 15 and contour 28 and, consequently, also temporary recess 30, move along contour 28 at a speed which decreases gradually until it eventually more or less equals the surface speed of recess 20 when the latter is loaded with the said cigarette 4 from temporary recess 30 the speed of which is slowed down even further to prevent it from interfering further with the cigarette (4) that has been unloaded.

Needless to say, if the direction of rotation of rollers 6 and 7 is inverted and the speed of the said rollers left unchanged, the device (3) described could be used for increasing the pitch between adjacent cigarettes 4 and transferring them from roller 7 to roller 6.

CLAIMS

1. Pitch regulating device for small rod-shaped items, the said device comprising a first and second counter-rotating roller and a device, arranged between the said rollers, for conveying the said items; the said rollers having first and second peripheral teeth respectively, each adjacent pair of the said first teeth and each adjacent pair of the said second teeth defining a first and second recess respectively for the said items; the said first and second recesses being evenly spaced round the first and second roller respectively with a first pitch and second pitch respectively, the latter being smaller than the said first pitch; the said rollers being arranged side by side and designed to turn round their respective axes in opposite directions and at speeds the ratio of the absolute values of which is equal to the ratio between the said respective pitches; characterised by the fact that the said conveying device comprises

- a channel, for guiding the said items, located between the said two rollers and extending between a point of intersection with a pitch surface on the said first roller and a point of essential tangency with
- 5 a pitch surface on the said second roller; part of the said first teeth extending inside the said channel and engaging, on one edge, with a side contour of the channel itself, so that each defines a temporary recess for one of the said items arranged along the
- 10 said channel; each of the said temporary recesses coinciding with one of the said first recesses at one point along the said channel; the said edge of each of the said first teeth being designed to move the relative temporary recess along the said channel at a
- 15 speed that can be regulated continuously between a maximum, equal to the surface speed of the said first recesses, and a minimum, essentially equal to the surface speed of the said second recesses.
2. Device according to claim 1, characterised by
- 20 the fact that the said first teeth are essentially serrated.
3. Device according to claim 1 or 2, characterised by the fact that the said edge of each said first tooth is curved with the concave side facing inwards in
- 25 relation to the said first roller.
4. Device according to claim 2 or 3, characterised by the fact that, when inside the said channel, the slope on each said edge of the said first teeth is the opposite of that on channel in relation to the radius
- 30 of the said first roller.
5. Pitch regulating device according to the previous claims and essentially as described and shown on the attached drawing for the purposes herein specified.

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